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DATA TO THE HYDROBIOLOGY OF THE MIDDLE AND LOWER TISZA RIVER REGION

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Abstract

The investigations carried out in the Middle and Lower Tisza Regions have demonstrated the effects of the tributary Sajó and of the Kisköre River Barrage, as well as a change in the character of the river regions.

Introduction

The investigations of the longitudinal section are reflecting the state of water quality in the river, in accordance with the water motion. The effect of waters flowing into the river and that of damming, as well as the change in the character of the river regions, can be demonstrated.

The investigations of the longitudinal section are often performed by Tisza-researchers; the algological investigations were carried out by UHERKOVICH (1968, 1971), the zoological ones by MEGYERI (1957), JÓSA (1962), and GÁL (1961, 1966).

Material and method

The investigations in the Middle and Lower Tisza Regions were carried out in a lasting small-water period, at the end of March 1974. We have supposed that the reaches investigated contain similar water masses. We took therefore samples on the same day (March 22), fixing quasi the momentary state. The samples were taken from the current-line of the Tisza above the Sajó mauth (497 river-km), at Polgár (486 river-km), at Tiszakeszi (470 river-km), Tiszacsege (454 river-km), Tiszafüred (433 river-km), Tiszaderzs (415 river-km), Kisköre (404 river-km), Tiszaroff (380 river-km), Nagykörü (364 river-km), above Szolnok (335 river-km), at Csongrád (244 river-km), and at Tápé (177 river-km). The chemical investigations were carried out on the basis of a uniform standard ("VITUKI" 1970) and Felföldy's (1974) notices. The total bacterial count was performed with membrane filter method, the algological investigations according to Utermöhl's technique, the zooplankton investigation in a counting tube. The samples in Csongrád and Tápé were taken by the research workers of the Laboratory in Szeged and also the basic chemical investigation of these two samples was performed by these. We acknowledge with thanks their kind cooperation.

Results

During the investigation of the longitudinal section the weather was calm, windless, and sunny. The air temperature was rather warm for the season (9 to 27 °C),

the temperature of the water surface rose slowly together with the rise in air temperature. In the morning we measured 8 °C, at noon 11.5 °C. In the course of the investigation, the water mass seemed to be slightly greenish in the whole sector.

The suspended matter content of the river was, in accordance with the character of water motion, low (17.4 to 23.6 mg/l), the water transparency was 50 to 60 cm. The dissolved oxygen and free carbon dioxide contents were of permanent value till the Kisköre River Barrage; in the reaches below the river barrage, however, we have observed a moderate increase in it. The mineral-substance content of the Tisza in the reaches investigated of the river did not change to a large extent, although below the Sajó mouth it is a little higher. The total phosphorus content has changed between 0.051 and 0.123 mg/l, the total nitrogen quantity was 2.756 to 4.286 mg/l. The mineral-nitrogen content has risen after the polluted Sajó and as a result of the industrial waters of Leninváros (cf.: Table 1).

The total bacterial count was comparatively low (6.12 to 11.34×10^6 ind./ml), and in the Tisza region investigated their number rose slowly. At the sampling point below the Kisköre River Barrage (Tiszaroff) the total bacterial count is regularly higher than before the river barrage (HAMAR 1975). MELNIKOV *et al.* (1973) demonstrated in the course of their investigations at the damming plants in the Dnieper that the bacterial count is 1.5 to 7.0 times higher in the sector after damming than above it. They have proved by means of experiments that a considerable part of microorganisms is destroyed by the strong current of water that goes with a multiplication of the microorganisms inducing the dissolution. The matters becoming available during their mineralization for algae promote the multiplication of these. In spite of the permanently low water output and damming, there couldn't develop any rich phytoplankton corresponding to the season. In the sector investigated we have found an association of 11 to 25 taxon-numbers. From the diatoms *Stephanodiscus tenuis* HUST., *Nitzschia acicularis* W. SMITH, *Asterionella formosa* HASSAL are the most frequent organisms, from the green algae *Ankistrodesmus falcatus* (CORDA) RALFS and *Ankistrodesmus falcatus* var. *setiforme* NYG., and from the Chrysophyta phyllum *Chrysococcus biporus* SKUJA are frequent (Table 2).

The species count in the reaches above the Sajó mouth is low (11). It can be followed till the end, how long the algae, that had got from the Sajó into the Tisza, are present there in the plankton. The phytoplankton of the Sajó is richer (20 taxons) and in the reaches below the Sajó mouth from the diatoms *Nitzschia palea* (KÜTZ.) SMITH and *Asterionella formosa* HASSAL, while from the green algae *Hyaloraphidium contortum* var. *tenuspinum* KORSCH. are the most considerable ones. The latter alga is heterotrophic and as many as several millions ind./l do appear in the bay of the Kisköre River Barrage at Abádszalók (HAMAR 1975*b*) as well as in the water of the experimental area near the river barrage (HAMAR 1975*c*). Even Chrysococcus biporus Skuja whose occurrence is so frequent in the Tisza, was getting from the Sajó to the Tisza (Table 2).

The change in the number of diatoms — mainly of *Stephanodiscus tenuis* HUST. — is characteristic of the quantitative dynamism. As a result of damming, the total algal count reaches its maxima at the Kisköre River Barrage, after that it falls. Later on, in the reaches at Tápé, the rise in number of the green algae is indicating the lower-reach character of the river (Fig. 1).

The total algal number of the eutrophic Sajó, charged with pollutions (VÁNCSA 1974, 1975) was similar to that of the Tisza at Kisköre. It appears from the quantitative analysis of algae that, in spite of the unfavourable climatic conditions, the Sajó

Table 2. *Phytoplankton of bay at Abádszalók late in the Autumn and in Winter* (10^3ind/1.)

Species	October 28		October 29		October 31		November 2		November 5		November 8		November 12		November 13		November 19		November 26		December 3		December 10		December 17	
	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%
Euglena viridis EHR.																							12			
Trachaelomonas volvocina EHR.		60		12									12													
Euglenophyta total		60	1,5	12	2,4	—	—		—						—		—		—		—		12	0,3	—	
Cryptomonas erosa EHR.	1320		60																60		300				60	
Cr. marssonii SKUJA	300																		60		24		120		60	
Cr. platyuris																					60		180		24	
Cr. pusilla BACH.	1020		12								12						12		180		1860		960		1500	
Cr. rufescens SKUJA	300		60								12		12						120		180		240		180	
Gymnodinium sp.	60																								12	
Pyrrophyta total	3000	78,9	132	26,8	—		—		—		24	6,7	12	3,4	—		12	1,7	420	29,4	2424	61,8	1500	41,3	1836	34,2
Chrysococcus biporus SKUJA	360		120		60		24						12						240		300		780		1680	
Mallomonas sp.																			12							
Synura uvella EHR.			60														12		60		60				60	
Chrysophyceae total	360	9,6	180	36,6	60	29,4	24	5,3	—		—		12	3,4	—		12	1,7	312	21,8	360	9,3	780	21,5	1740	32,3
Asterionella formosa HASSAL															12		24				60		60		24	
Cyclotella meneghiniana KÜTZ.			60				60												24							
Melosira granulata v. *angustissima* MÜLL.			12		60		60				60												12			
M. varians AGH.	12																									
Navicula cryptocephala KÜTZ.											12															
Nitzschia acicularis W. SMITH	12														12				12							
Nitzschia spp.					12		120		60		12															
Stephanodiscus tenuis HUST.	12		60		60		60				120		12		12		120		180		120		240		420	
Synedra acus KÜTZ.											12						12									
Bacillariophyceae total	36	0,9	132	26,9	132	64,8	300	65,8	60	16,1	216	60,0	12	3,4	36	8,8	152	18,7	216	15,1	180	4,5	312	8,5	444	8,6
Ankistrodesmus acicularis (A. BR.)KORSCH.	12																									
A. falcatus (CORDA)RALFS	60						60				60															
A. longissimus (LEMM.)WILLE							60								60				24		180		180		480	
Crucigenia terapedia (KIRCH.)W. et G. S. WEST																	120		24		120				12	
Didymocystis planctonica KORSCH.	60																		60							
Elakatothrix gracilis HORTOB.									300				300		12				60							
Oocystis borgei SNOW	60														300		300		300		600		600		600	
Pediastrum duplex MEYEN																										
Scenedesmus ecornis (RALFS) CHOD.	60		12		12																		60			
Sc. denticulatus v. *linealis* HANGS.	24																						120			
Sc. intermedius CHOD.																							12			
Sc. quadricauda (TURP.)BRÉB.	60								12								12									
Selenastrum minutum																			12						12	
Tetrastrum glabrum (ROLL)AHL. et TIFF.			12																		60				60	
Chlorococcales spp.											60															
Chlamydomonas reinhardii DANG.																	60									
Closterium acutum BRÉB.	12		12				12										60						60		180	
Chlorophyta total	348	9,1	36	7,3	12	5,8	132	28,9	312	83,9	120	33,3	300	86,4	372	91,2	552	77,9	480	33,7	960	24,5	1032	28,4	1344	24,9
Total number of algae	3804	100	492	100	204	100	456	100	372	100	360	100	348	100	408	100	708	100	1428	100	3924	100	3636	100	5364	100

Table 2. *Phytoplankton data of the longitudinal-section investigation of the river Tisza (March 22nd 1974) 10³ind./l*

Species	Tisza above the Sajó 497 rkm		Sajó at its mouth		Tisza at Polgár 486 rkm		Tisza at T-keszi 470 rkm		Tisza at T.csege 456 rkm		Tisza at T.füred 433 rkm		Tisza at T-derzs 415 rkm		Tisza at Kisköre 404 rkm		Tisza at T.roff 380 rkm		Tisza at Nagykörü 364 rkm		Tisza at Szolnok 335 rkm		Tisza at Csongrád 244 rkm		Tisza at Tápé 177 rkm	
	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%
Lyngbia limnetica LEMM.																									60	
Microcystis sp.			6																							
Cyanophyta total	—		6	0,3	—		—		—		—		—		—		—		—		—		—		60	7,2
Euglena viridis EHR.	12		36		12		6		6		6		6		6		6						18		24	
Trachaelomonas volvocina EHR.	12				12		12		12						6								12		12	
Euglenophyta total	24	10,5	36	1,5	24	5,2	18	3,2	18	4,2	6	0,6	6	0,6	48	2,5	6	1,2	—		—		30	10,2	36	4,3
Chroomonas acuta Uterm.			12		6																					
Cryptomonas ovata EHR.	18		48		6		6		6										18		18				6	
Cr. platyuris SKUJA											6				6				12							
Cr. pusilla BACH.			18		30		6		6		6		6		30		12		42		24					
Gymnodinium sp.			6																							
Pyrrophyta total	18	7,9	84	3,5	42	9,1	12	2,	18	4,2	6	0,6	6	0,6	36	1,8	12	2,5	72	13,5	42	9,0	—		6	0,7
Chrysococcus biporus SKUJA			6		6						12		18		24		12		6		30		6		30	
Ch. rufescens KLEBS	6		24		12		6				24		6		30		18		30		24				12	
Chrysophyceae total	6	2,6	20	1,3	18	3,9	6	1,1	—		36	3,5	24	2,4	54	2,8	30	6,2	36	6,8	54	11,6	6	2,0	42	5,0
Asterionella formosa HASSAL			90		6		18		6		78		48		54		6		12		6		6		6	
Cyclotella compta (EHR.) KÜTZ.							6		6		12		6				6		6		6					
Diatoma elongatum (LYNG.) AGH.													6													
D. vulgare BORY	42				84		36		30		6		6				6		6		6					
Fragilaria capucina DESM.																	6									
Gomphonema olivaceum (LYNG.) KÜTZ.			12		6		6																			
Melosira distans (EHR.) KÜTZ.					12				6		12														6	
Navicula cryptocephala KÜTZ.							6		6																	
Navicula spp.			24						6												6					
Nitzschia acicularis W. SMITH	24		66		30		42		54		30		12		12		6		30		12		6		48	
N. palea (KÜTZ.) SMITH			210		18		30				42		6		18				6							
Nitzschia spp.															12		12				12		6			
Stephanodiscus tenuis HUST.	42		780		73		198		132		630		660		1380		246		252		186		90			
Suriella ovata KÜTZ.			6				6		12				6		30		36		6		12		12		12	
Synedra acus KÜTZ.											6		12		6		6		6		12				24	
S. ulna (NITSCH.) EHR.			198		18		24		12						6											
other diatoma spp.	24		42		18		6		12		18		12		18		6		12				12		18	
Bacillariophyceae total	132	57,9	1428	60,2	264	57,1	378	68,5	282	65,2	834	80,8	774		1536	79,8	336	69,2	330	62,7	263	56,3	132	44,9	114	13,7
Ankistrodesmus acicularis (A. BR.) KORSCH.																									6	
A. angustus BERN.																									12	
A. falcatus (CORDA) RALFS			126		30		18				6		36		54		12						48		108	
A. falcatus v. setiforme NYG.	6		108		12		36		18		54		36		54		36		30		66		12		42	
Chodatella quadriseta LEMM.																									6	
Crucigenia tetrapedia (KIRCH.) W. et G. S. WEST																					6					
Dictyosphaerium pulchel																									42	
Hyaloraphidium contortum v. tenuispinum KORSCH.			270		6		6		6										6		6		12		30	
Pediastrum boryanum (TURP.) MENEGH.																									6	
Scenedesmus acuminatus (LAGER.)CHOD.													6												6	
Sc. acutus MEYEN									6																6	
Sc. ecornis (RALFS) CHOD,			6								6															
Sc. intermedius CHOD.											6				12								6		30	
Sc. quadticauda (TURP.) BRÉB.																										
Sc. spinosus CHOD.	6																									
Selenastrum minutum (NAEG) COLLINS																										
Tetrastrum elegans PLAYF.													12												66	
Tetrastrum glabrum (ROLL) AHL. et																										
Chlorococcales spp.															6										18	
Chlamydomonas reinhardii DANG.			6								6		12		30		12		42		30		24		66	
Chlamydomonas spp.	12		12		18		12		12		36		36		72		42		12				18		126	
Closterium acutum BRÉB.	18		78		30		24		42		36		42		24											
Chlorophyta total	6		180		18		42		30																6	
Chlorophyta total	48	21,1	786	33,2	114	24,7	138	25,0	114	26,4	150	14,5	186	18,7	252	13,1	102	20,9	90	17,0	108	23,1	126	42,5	576	69,1
Total number of algae	228	100	2370	100	462	100	552	100	432	100	1032	100	996	100	1926	100	486	100	528	100	467	100	254	100	834	100

has an influence on the algological composition of the Tisza. The effect of damming on the increase in the algal count is proved by the quantitative results unequivocally.

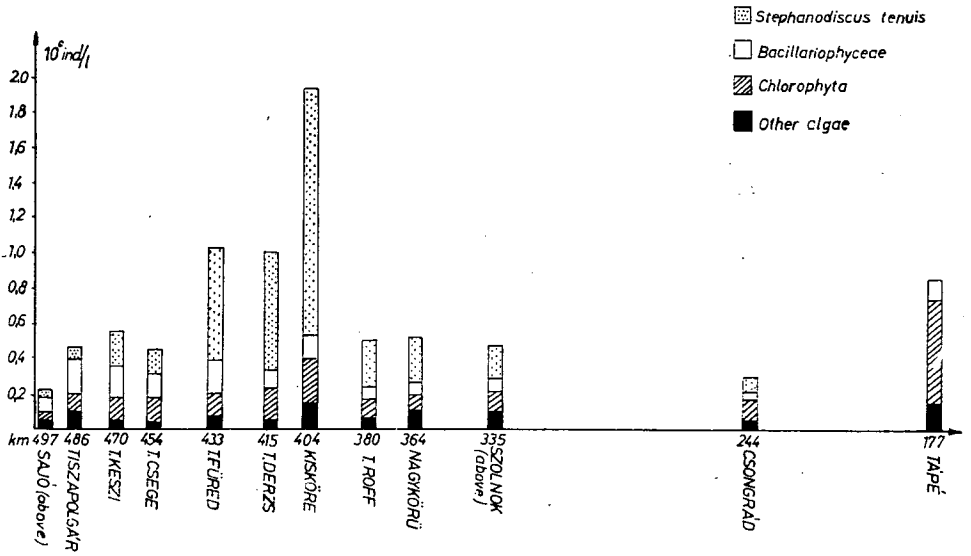

Fig. 1. Changes in the total algal count of the Tisza (March 22nd 1974)

In the course of our investigations so far (ÁDÁMOSI *et al.* 1974, VÉGVÁRI 1975) we observed that the suspended matter content of water is decreased by the winter and early spring dammings to minima but, because of the unfavourable climatic conditions, the maximum total algal number does not reach the values of the summer damming. As the food content is available during damming (B. TÓTH 1975), the alga stand of the river reaches between the Tisza sector above the Sajó mouth and the Kisköre River Barrage achieved the maximum tempo of increase corresponding to the temperature (GOLDMANN and CARPENTER 1974).

In the course of our investigations we found not more than two Zooflagellata species: *Monosiga ovata* KENT occurred in the Sajó and *Desmarella moniliformis* KENT in the Tisza at Tiszakeszi.

Corresponding to the early spring period, in the Rotatoria plankton of the Tisza the species occurring regularly in cold waters were dominant. Below the mouth of the Sajó (486 river-km), both the species and individual number were rising. The species occurring in a considerable number in the Sajó *(Epiphanes senta* O. F. MÜLLER, *Notholca squamula* O. F. MÜLLER, *Rotaria rotatoria* PALLAS*)* were found-in an essentially smaller quantity in the Tisza below the Sajó mouth, as well. The species *Epiphanes senta* O. F. MÜLLER that is characteristic of the polluted waters turned up, till Tiszafüred, from every sampling point. The individual density of Rotatoria was the greatest at the Kisköre sampling point above the river barrage, while in the sector below the barrage their quantity considerably decreased (Fig. 2).

In the course of the investigation of the longitudinal sector, the occurrence of the group Cladocera wa sunimportant. The Copepoda plankton was formed by the individuals in nauplius and copepodit state found in large numbers in addition to the

few fully developed organisms. The individual density of the Cladocera and Copepoda planktons was not considerably influenced by the Kisköre damming (Table 3).

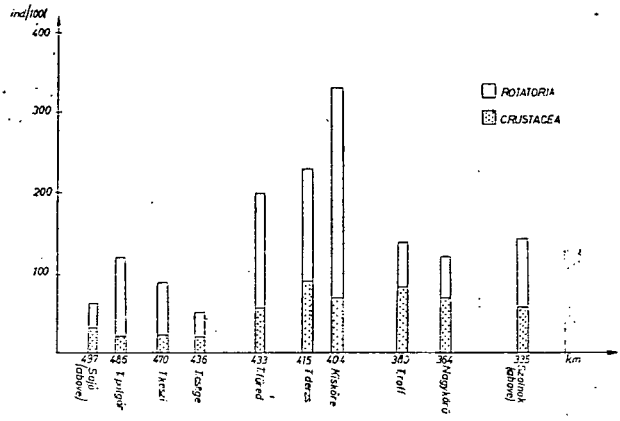

Fig. 2

It could be demonstrated in the course of our investigations that the character of plankton is influenced by the tributary (Sajó) and by the industrial pollutions, as well as changed by impoundment.

References

ÁDÁMOSI, M. *et al.* (1974): Duzzasztás hatása a Tisza vízminőségére a kiskörei vízlépcső térségében (Influence of damming upon the water-quality of the Tisza in the area of the Kisköre River Barrage.) — Hidr. Közl. *12*, 570—576.

B. TÓTH, M. (1975): A Tisza vízkémiai viszonyai 2. (Hydrochemical conditions of the Tisza River 2). — Tiscia (Szeged) *11*.

GÁL, D. (1961): Das Leben der Tisza. X. Die Rhizopodenfauna der auf ungarischem Boden fließenden Strecke der Tisza im Jahre 1959/1960. — Acta Biol. (Szeged) *7*, 77—84.

GÁL, D. (1966): Angaben zur Rhizopoden-Fauna der Theiß-Strecke zwischen Szolnok—Csongrád. — Acta Biol. (Szeged) *12*, 115—124.

FELFÖLDY, L. (1974): A biológiai vízminősítés (Biological water qualification). Vízügyi hidrobiológia 3 (Water conservancy hydrobiology 3), VIZDOK. — Budapest.

GOLDMAN, J. C. and CARPENTER, E. J. (1974): A kinetic approach to the effect of temperature on algal growth. — Limnol. and Ocean. *19*, 756—766.

HAMAR, J. (1975*a*): Data to the bacteriological and algological conditions of the region of Kisköre River Barrage. — Tiscia (Szeged) *11*.

HAMAR, J. (1975*b*): Investigation of bacterio-and phytoplanktons in the experimental area of Abádszalók, at the Kisköre River Barrage. — Tiscia (Szeged) *11*.

HAMAR, J. (1975*c*): Bacteriological and algological investigation of the bay at Abádszalók (Kisköre Reservoir). — Tiscia (Szeged) *11*.

JÓSA, Z. (1962): A Felső-Tisza Ciliata-faunájának faunisztikai, ökológiai és cönológiai vizsgálata (Faunistical, ecological and coenological investigation of the Ciliata-fauna in the Upper Tisza Region). — Yearbook of the Teachers' Training College, Szeged 93—113.

MEGYERI, J. (1957): Plankton vizsgálatok a Felső-Tiszán (Plankton investigations in the Upper Tisza Region). — Yearbook of the Teachers' Training College, Szeged 67—84.

MELNIKOV, G. B. *et al.* (1973): On the theory of natural self-purification of reservoirs. — Verh. Internat. Verein. Limnol. *18*, 1320—1325.

UHERKOVICH, G. (1968): Über verschiedene Typen der Algenmassenvermehrung in der Tisza (Theiß). — Tiscia (Szeged) *4*, 11—20.

UHERKOVICH, G. (1971): A Tisza lebegő paránynövényei (A Tisza fitoszesztonja) (Floating microphytes of the Tisza (Phytoseston of the Tisza). — Szolnok.
VÁNCSA, A. (1974): Adatok Észak-Magyarország vízfolyásainak algavegetációjához, különös tekintettel a vízminőségi állapotok megítélésére. 1. Egy Sajó-hossz-szelvényvizsgálat algológiai eredményei (Data to the algal vegetation of the water-courses in Northern Hungary, with particular regard to taking in the states of water quality. 1. The algological results of a longitudinal-section investigation in the Sajó). — Hidr. Közl. *9*, 419—425.
VÁNCSA, A. (1975): A Sajó vízminőségi jellemzése biológiai vizsgálatok alapján (Characterization of the water quality in the Sajó on the basis of biological investigations). — Hidr. Közl. *3*, 130—136.
VÉGVÁRI, P. (1975): Hydrochemical conditions of the River Tisza 1. — Tiscia (Szeged) *11*.
"VITUKI" (1970): Unitary methods of COMECON for water investigation. — Budapest.

Table 1. *Chemical results of the longitudinal section*

Sampling point	Tisza- above the Sajó mouth	Sajó at the mouth	Tisza Polg.	Tisza- keszi
Component	497	495	486	470
Weather	sun- schine, calm	sun- schine, calm	sun- shine, calm	sun- shine, calm
Degree of air temperature	9,0	9,0	21,0	4,5
Degree of water temperature	8,0	12,5	9,0	10,5
Colour	greenish	black- ish brown	greenish	greenish
Smell		s m e l l - l e s s		
Transparency mm	500	520	510	510
C.O.D.Mn mg/l	3,6	39,6	4,2	6,7
C.O.D.Cr mg/l	10,8	72,0	14,0	15,2
Dissolved O_2 mg/l	11,5	4,8	11,1	10,3
Oxygen saturation mg/l	97,1	45,3	96,1	92,4
*p*H	7,3	7,4	7,5	7,5
Conductivity	430	1006	371	387
"m" alkalinity	2,5	4,8	2,5	2,6
Total hardness, int	7,8	16,1	7,8	8,0
Carbonate hardness, int.	7,0	13,4	7,0	7,3
Ca^{2+} mg/l	36,9	94,6	37,7	41,7
Mg^{2+} mg/l	11,1	12,3	11,2	9,2
Na^+	51,5	85,0	54,0	55,2
K^+	7,5	23,5	9,6	8,0
Cl^-	23,8	63,8	26,7	29,5
Son 4^{2-}	15,1	57,3	22,2	25,4
HCO_3	152,6	292,9	152,6	158,7
Free CO_2 mg/l	2,8	10,8	2,9	2,8
Fe^{2+}	1,459	1,741	1,348	1,348
NH_4^+	0,481	12,966	0,666	1,128
NO_2^-	0,120	0,720	0,142	0,180
NO_3-	8,363	4,838	8,815	6,235
Po_4 3^-	0,044	0,394	0,044	0,061
Total dissolved matter mg/l	190	488	241	228
Total suspended matter mg/l	210	15	21,8	23,6
Total dry matter mg/l	20	503	263	255
Dissolved orthophosphate P mg/l	0,014	0,128	0,014	0,019
Dissolved non-reactive P mg/l	0,043	0,015	0,029	0,038
Total disolved P	0,057	0,143	0,043	0,057
Formed P mg/l	0,022	0,008	0,008	0,020
Total P mg/l	0,079	0,151	0,051	0,077
Nitrate-N mg/l	1,889	1,093	1,991	1,408
Nitrite N mg/l	0,037	0,819	0,043	0,055
Ammonium-N	0,368	9,897	0,507	0,859
Free ammonium-N mg/l	0,005	0,171	0,010	0,017
Inorganic-N mg/l	2,299	11,380	2,551	2,339
Kjeldahl-M mg/l	1,961	11,174	1,666	1,293
N of organic bond mg/l	1,588	1,106	1,149	0,417
Total N mg/l	3,887	12,486	3,700	2,756

investigation of the Tisza (March 22nd 1974)

Tisza-csege	Tisza-füred	Tisza-derzs	Kisköre	Tiszaroff	Nagy-körü	Szolnok above the Zagyva	Tápé	Csongrád
456	433	415	404	380	364	335,4	177	246
sunny, calm	sunny, calm	sunny, calm	sunny, calm	sunny, calm	starry sky, calm	starry sky	sunny	sunny
22,5	27,0	25,5	24,5	19,0	14,5	14,2	24,0	17,0
10,5 green-ish	11,5 green-ish	9,5 green-ish	9,5 green-ish	9,5 green-ish	10,0 —	9,5 —	13,8 yellow	11,2 yellow-grey
600	600	600	600	480	immeasurable		147	160
5,8	5,6	5,5	6,5	5,8	5,2	6,0	5,0	3,5
20,4	18,0	17,2	18,0	15,2	13,2	12,4	22,0	21,0
10,7	10,5	10,2	10,4	11,1	11,2	11,1	11,9	11,0
96,0	96,6	89,4	91,1	97,3	99,4	97,3	115,0	100,0
7,5	7,6	7,5	7,5	7,5	7,5	7,6	7,5	7,6
364	387	364	371	333	348	340	410	390
2,5	2,6	2,5	2,6	2,5	2,5	2,5	2,45	2,26
7,7	8,2	7,8	8,3	8,1	8,1	8,4	8,8	8,3
7,0	7,3	7,0	7,3	7,0	7,0	7,0	6,9	6,3
40,1	43,3	40,9	42,5	43,3	44,1	44,9	47,0	42,0
9,2	9,2	9,2	10,2	8,8	8,1	9,2	9,7	10.0
55,5	56,0	38,5	39,0	54,0	49,0	45,5	20,0	18,0
8,5	9,0	5,0	5,0	8,0	7,5	8,0	7,5	8,0
28,6	28,6	26,7	26,7	23,8	22,9	23,18	31,0	29,0
20,5	21,9	22,7	25,3	22,1	20,5	21,8	51,0	29,0
152,7	158,6	152,6	158,6	152,6	152,6	152,6	150,0	138,0
2,6	2,0	2,8	2,6	3,0	3,1	3,1	2,0	2,0
1,179	1,100	1,010	0,954	1,291	1,101	1,126	0,030	0,025
0,925	1,165	0,758	1,109	0,925	0,925	0,869	1,50	1,60
0,158	0,165	0,151	0,180	0,112	0,128	0,128	0,14	0,13
7,310	7,632	7,955	8,600	8,062	8,600	6,772	7,000	7,000
0,044	0,041	0,061	0,044	0,044	0,044	0,044	0,16	0,130
196	208	117	204	198	189	194	285	270
21,8	19,2	20,4	18,8	21,0	17,4	19,0	40,0	55,0
218	227	137	223	210	206	213	325	325
0,014	0,014	0,019	0,014	0,014	0,014	0,014	—	—
0,052	0,043	0,015	0,029	0,009	0,014	0,086	—	—
0,071	0,057	0,034	0,043	0,020	0,028	0,100	—	—
0,020	0,022	0,017	0,008	0,002	0,023	0,023	—	—
0,091	0,079	0,051	0,051	0,022	0,051	0,123	—	—
1,651	1,724	1,797	1,943	1,821	1,943	1,530	—	—
0,048	0,050	0,048	0,055	0,034	0,039	0,039	—	—
0,704	0,885	0,576	0,845	0,704	0,704	0,660	—	—
0,014	0,020	0,012	0,017	0,014	0,014	0,015	—	—
2,417	2,679	2,433	2,860	2,573	2,700	2,244	—	—
1,924	1,982	2,441	1,723	1,579	1,551	1,579	—	—
1,206	1,077	1,853	0,861	0,861	0,833	0,904	—	—
3,623	3,756	4,285	3,721	3,434	3,533	3,148	—	—

Table 3. *Rotatoria and Crustacea data of the longitudinal-section investigation of the Tisza (March 22nd 1974), (ind/100 l)*

Species	Tisza above the Sajó 497 rkm	Sajó at its mouth	Tisza at Polgár 486 rkm	Tisza at T.keszi 470 rkm	Tisza at T.csege 456 rkm	Tisza at T. füred 433 rkm	Tisza at T.derzs 415 rkm	Tisza at Kisköre 404 rkm	Tisza at T.roff 380 rkm	Tisza at Nagy-körü 364 rkm	Tisza at Szolnok 335 rkm
ROTATORIA											
Brachionus angularis Gosse								16	6	2	6
Br. calyciflorus var. *dorcas* f. *spinosa* (WIERZEJSKI)				4		2	2				
Br. leydigi var. *quadratus* (ROUSSELET)		4					6	6			
Br. urceolaris O. F. MÜLLER	4	28	6	2	4						
Br. quadridentatus var. *brevispinus* (EHRB.)							16	4			
Euchlanis dilatata EHRB.							4				
Epiphanes senta (O. F. MÜLLER)	4	56	4	6	6	6					
Filinia longiseta (EHRB.)								4			
Kellicottia longispina (KELLICOTT)	4							6			
Keratella cochlearis cochlearis GOSSE			4	6	4	4					
K. cochlearis var. *machracantha* LAUTERBORN		18	4								
K. cochlearis var. *macracantha* f. *micracantha* LAUTERBORN						8	18	70	16	8	14
K. quadrata (O. F. MÜLLER)		26	2		2	14	18	18	8	6	8
Notholca acuminata (EHRB.)		8	8				12				
N. squamula (O. F. MÜLLER)		100	16	14		38		24			24
Polyarthra longiremis CARLIN		12		8	4	10	26	48	24	24	36
Rotaria rotatoria (PALLAS)	8	780	58	10	4		14		12		
Synchaeta grandis ZACHARIAS				28	10	38	6			12	
S. oblonga EHRB.	12					26		36			
Total Rotatoria:	32	1032	102	78	34	146	122	232	66	52	88

CRUSTACEA											
Cladocera											
Chydorus sphaericus O. F. MLÜLER							2				
Total Cladocera:	—	—	—	—	—	—	2	—	—	—	—
Calanoida											
Eudiaptomus gracilis G. O. SARS	4				2				2		44
Nauplius	8				4			6	28	16	10
Total Calanoida:	12	—	—	—	6	—	—	6	30	16	54
Cyclopoida											
Cyclops strenuus Fischer							2				
Eucyclops speratus LILLJEBORG				2							
Copepodit				4		8	6	8	14	8	
Nauplius	18	48	20	14	14	46	76	52	38	42	
Total Cyclopoida:	18	48	20	20	14	54	84	60	52	50	—
OTHER ORGANISM											
Nematoda spp.	6	2800	18	60	22	24	—	—	—	—	—